coasts of Great Britain. The Bermuda storm above referred to apparently united with this low area by the 8th. Under the influence of the Iceland area of low pressure, which had apparently assumed a position more to the eastward than usual, and of areas of low pressure which advanced from the ocean, low pressure and stormy weather continued over the British Isles until the 23d. On the 13th and 14th immense damage was caused to coast and inland property in England, Ireland, and the south of Scotland, and gales of destructive violence continued during the 15th and 16th.

The presence of a cyclonic area over the east part of the Caribbean Sea was indicated by reports of the 13th to 15th. During the 15th the path apparently recurved northward over or near San Domingo, and the morning of the 17th the center was located east of the Bahamas, whence it moved north-northeast and reached the south coast of Newfoundland on the 20th. On the 17th gales of hurricane force were encountered east-northeast of the Bahamas. The night of the 17th a strong southeast gale set in at Bermuda. On the 18th, at 10 a. m., the barometer fell to 29.30 (744) at Bermuda, and during the day the wind was southeast to southwest and reached force 11, causing considerable damage. The storm-center passed west of Bermuda about 7 p. m. of the 18th. During the 19th there was an apparent decrease in energy, and during the 20th the path recurved westward and the storm united with low area V, which was moving down the Saint Lawrence Valley.

On the 25th low area VIII had advanced north of Newfoundland, and on the 28th low area VII had reached the east Newfoundland coast, whence it apparently moved eastward to mid-ocean by the close of the month.

FOG IN OCTOBER.

The limits of fog belts west of the 40th meridian, as determined from reports of shipmasters, are shown on Chart I by dotted shading. Near the Banks of Newfoundland fog was reported on 9 dates; and between the 55th and 65th meridians on 2 dates. No fog was reported by shipmasters west of the 65th meridian. Compared with the corresponding month of the last 4 years the dates of occurrence of fog near the Grand Banks numbered 5 less than the average, and between the 55th and 65th meridians 2 less than the average. West of the 65th meridian the average number of dates for which fog has been reported in October during the last 4 years is 3. Dense fog was reported at stations along the New England and New York coasts from the 3d to 5th. The fog reported west of the 40th meridian and at Weather Bureau stations on the New England and New York coasts attended the approach or passage of general storms.

OCEAN ICE IN OCTOBER.

The following table shows the southern and eastern limits of the region within which icebergs or field ice were reported for October during the last 9 years:

Southern limit.			Eastern limit.		
Month.	Lat. N.	Long. W.	Month.	Lat. N.	Long. W.
	° ′	° ′		° ′	° ′
October, 1883	46 56	46 22	October, 1883	46 56	46 22
October, 1884	Off Cape Race		October, 1884	46 56	50 55
October, 1885	48 21	47 12	October, 1885	48 21	47 12
October, 1886	41 34	49 43	October, 1886	46 03	46 37
October, 1887	42 58	50 02	October, 1887	42 58	50 02
October, 1888	51 43	55 36	October, 1888	51 43	55 36
October, 1889	44 32	49 28	October, 1889	46 30	45 59
October, 1890	44 47	49 33	October, 1890	47 56	45 45
October, 1891	48 04	48 27	October, 1891	48 04	48 27
Mean	46 09	49 56	Mean	47 16	48 33

The southernmost and eastermost ice reported was one iceberg, noted on the 3d in the position given in the table. This was the only date for which ice was reported south of the 50th parallel. Icebergs were reported in or east of the Straits of Belle Isle on the 5th, 6th, 11th, 12th, and 25th. The quantity of Arctic ice reported was notably deficient when compared with that observed for October during the last 9 years. The positions of icebergs reported for the current month are shown on Chart I by ruled shading.

TEMPERATURE OF THE AIR (expressed in degrees, Fahrenheit).

Many of the voluntary stations do not have standard thermometers or shelters.

The distribution of mean temperature over the United States and Canada for October, 1891, is exhibited on Chart II by dotted isotherms. In the table of miscellaneous meteorological data the monthly mean temperature and the departure from the normal are given for regular stations of the Weather Bureau. The figures opposite the names of the geographical districts in the columns for mean temperature and departure from the normal show, respectively, the average for the several districts. The normal for any district may be found by adding the departure to the current mean when the departure is below the normal and subtracting when above. The monthly mean temperature for regular stations of the Weather Bureau represents the mean of the maximum and minimum temperatures.

The mean temperature was highest at stations in the Colorado Desert in the east part of San Diego county, Cal., where it was above 80, and the mean values were above 70 over the southern half of the Florida Peninsula, in extreme southern Louisiana, in the lower Rio Grande valley, and in adjoining parts of southeastern California and western Arizona. The mean temperature was lowest in the mountains of Colorado and over the greater part of Canada east of the 115th meridian, where it was below 40, and the mean readings were below 50 north of a line traced from the middle New England coast westward to the eastern slope of the Rocky Mountains, thence southward to central New Mexico, and thence irregularly northwestward to northeast Washington. The mean temperature was also below 50 at stations on the Central Pacific Railway crossing the summit of the Sierra Nevada Mountains in California.

DEPARTURES FROM NORMAL TEMPERATURE.

The mean temperature was generally above the normal on the Pacific coast, over the plateau and Rocky Mountain regions, and from the middle and upper Missouri valleys eastward over the west and north parts of the Lake region to the Saint Lawrence Valley. Along the Atlantic coast from Nova Scotia to Florida and thence westward to Kansas and Texas the mean temperature was below the normal.

The greatest departure above the normal temperature occurred at stations in the west part of the plateau region, on the north Pacific coast, and in northern California, where it was 2 to 4, and the most marked departure below the normal temperature was noted along the south Atlantic and east Gulf coasts, where it exceeded 4.

DEVIATIONS FROM NORMAL TEMPERATURE.

The following table shows for certain stations, as reported by voluntary observers, (1) the normal temperature for October for a series of years; (2) the length of record during which the observations have been taken, and from which the normal has been computed; (3) the mean temperature for October, 1891; (4) the departure of the current month from the normal;

(5) and the extreme monthly mean for October during the period of observation and the years of occurrence:

State and station.	County.	(1) Normal for the month of Oct.	(2) Length of record.	(3) Mean for Oct., 1891.	(4) Departure from normal.	(5) Extreme monthly mean for October. Highest.	Year.	Lowest.	Year.
Arkansas.		°	*Years*	°	°	°		°	
Lead Hill	Boone	60.1	10	.....	.....	64.0	1881	56.0	1885
California.									
Sacramento	Sacramento	61.5	38	55.4	— 6.1	69.9	1875	53.9	1890
Connecticut.									
Middletown	Middlesex	50.0	24	49.3	— 0.7	54.7	1871	45.5	1888
Florida.									
Merritts Island	Brevard	75.7	9	72.9	— 2.8	79.0	1882	72.9	1891
Georgia.									
Forsyth	Monroe	67.1	17	64.4	— 2.7	75.4	1884	61.7	1885
Illinois.									
Peoria	Peoria	53.9	32	54.3	+ 0.4	62.7	1879	45.2	1869
Riley	McHenry	47.9	35	49.4	+ 1.5	56.0	1879	38.6	1869
Indiana.									
Vevay	Switzerland	55.9	25	54.2	— 1.7	65.0	1879	43.2	1869
Iowa.									
Cresco	Howard	45.8	19	46.2	+ 0.4	54.1	1879	41.2	1873
Monticello	Jones	49.0	36	48.8	— 0.2	58.0	1879	36.0	1873
Logan	Harrison	52.7	17	54.0	+ 1.3	60.7	1879	48.5	1875
Kansas.									
Lawrence	Douglas	54.4	23	54.1	— 0.3	60.5	1879	44.0	1869
Wellington	Sumner	56.9	12	.....	.....	60.6	1879,'84	53.3	1880, '83
Louisiana.									
Grand Coteau	Saint Landry	68.5	10	63.4	— 5.1	75.5	1883	63.4	1891
Maine.									
Orono	Penobscot	45.6	21	45.4	— 0.2	49.7	1879	42.1	1888
Maryland.									
Cumberland	Allegany	50.9	32	51.5	+ 0.6	60.0	1881	41.8	1869
Massachusetts.									
Amherst	Hampshire	48.8	55	48.6	— 0.2	56.0	1879	42.8	1841
Newburyport	Essex	49.3	13	49.2	— 0.1	55.0	1879	45.1	1888
Somerset	Bristol	52.4	19	52.6	+ 0.2	58.1	1879	47.6	1874
Michigan.									
Kalamazoo	Kalamazoo	49.9	15	51.9	+ 2.0	54.5	1879	45.7	1887
Thornville	Lapeer	50.4	14	49.7	— 0.7	58.5	1879	45.6	1889
Minnesota.									
Minneapolis	Hennepin	45.3	26	46.7	+ 1.4	56.1	1879	36.5	1869
Montana.									
Fort Custer	Custer	46.7	12	55.0	+ 8.3	55.0	1891	42.2	1883
New Hampshire.									
Hanover	Grafton	44.9	56	46.4	+ 1.5	52.4	1879	38.6	1836
New Jersey.									
Moorestown	Burlington	53.4	28	52.7	— 0.7	59.5	1879	48.6	1888
South Orange	Essex	52.7	21	50.7	— 2.0	58.1	1879	47.2	1871
New York.									
Cooperstown	Otsego	46.4	37	45.1	— 1.3	53.3	1879	40.7	1865
Palermo	Oswego	47.3	31	46.8	— 0.2	53.9	1879	41.8	1889
North Carolina.									
Lenoir	Caldwell	56.6	20	52.6	— 4.0	66.4	1878	48.0	1874
Ohio.									
N'th Lewisburgh	Champaign	51.9	59	52.2	+ 0.3	58.0	1852	43.0	1869
Wauseon	Fulton	50.4	21	49.0	— 1.4	59.0	1879	45.2	1889
Oregon.									
Albany	Linn	52.1	11	54.0	+ 1.9	56.3	1885	48.7	1881
Eola	Polk	51.5	20	54.2	+ 2.7	59.7	1876	45.4	1873
Pennsylvania.									
Dyberry	Wayne	46.5	23	44.1	— 2.4	53.4	1879	41.2	1869
Grampian Hills	Clearfield	47.7	27	46.1	— 1.6	56.4	1879	39.2	1869
Wellsborough	Tioga	49.9	12	44.4	— 5.5	60.0	1880	41.2	1889
South Carolina.									
Statesburgh	Sumter	63.4	10	58.7	— 4.7	69.0	1881	58.7	1891
Tennessee.									
Austin	Wilson	59.4	22	57.2	— 2.2	70.2	1879	52.5	1888
Texas.									
New Ulm	Austin	69.7	18	69.0	— 0.7	73.9	1881	65.8	1873
Vermont.									
Strafford	Orange	46.7	18	46.6	— 0.1	52.8	1879	40.6	1888
Virginia.									
Birdsnest	Northampt'n	60.8	23	58.0	— 2.8	69.2	1881	54.5	1869
Washington.									
Fort Townsend	Jefferson	50.5	15	51.4	+ 0.9	54.6	1875	48.6	1879
Wisconsin.									
Madison	Dane	47.9	22	45.4	— 2.5	59.4	1864	39.8	1869

YEARS OF HIGHEST MEAN TEMPERATURE FOR OCTOBER.

At stations in southern Montana, southeastern Washington, and on the north Pacific coast the mean temperature for the current month was the highest ever reported for October. At Fort Custer, Mont., and Port Angeles, Wash., the mean was 4.2 and 0.4, respectively, above the highest mean previously reported for the month, noted in 1889, and at Roseburgh, Oregon, and Walla Walla, Wash., the mean was 1.6 and 0.7, respectively, above that of 1888. The highest mean temperature for October occurred generally from the north Pacific coast to western North Dakota in 1889; along the middle Pacific coast in 1887; in the Red River of the North Valley in 1886; from the east Gulf coast over the interior of the south Atlantic states and eastern Tennessee in 1884; in the lower Mississippi valley in 1883; along the Atlantic coast south of the 40th parallel in 1881; and from the lower Missouri and upper Mississippi valleys over the Lake region, the Ohio Valley, New York, and New England in 1879.

YEARS OF LOWEST MEAN TEMPERATURE FOR OCTOBER.

At stations in the south Atlantic and east Gulf states and Florida the mean temperature for the current month was the lowest ever reported for October by amounts varying from 0.2 at Key West, Fla., to 1.8 at Auburn, Ala. The lowest mean temperature for October occurred generally in New York and New England in 1888; in the north-central valleys and Texas in 1887; on the south Pacific coast in 1886; from eastern Kansas to Louisiana in 1885; over the middle plateau and the west part of the southern plateau in 1883; from the middle Pacific coast over the northeast slope of the Rocky Mountains in 1881; along the Atlantic coast south of the 40th parallel, and in eastern Michigan and the upper Ohio valley in 1876; and in the middle Mississippi, lower Ohio, and lower Missouri valleys in 1873.

In 1887, when the mean temperature was the highest noted for October on the middle Pacific coast, it was the lowest reported for that month in north-central and south-central parts of the country. In 1886, when it was the highest in the Red River of the North Valley, it was the lowest on the south Pacific coast. In 1881, when it was the highest along the Atlantic coast south of the 40th parallel, it was the lowest from the middle Pacific coast over the northeast slope of the Rocky Mountains.

TEMPERATURE, JANUARY TO OCTOBER.

For the period January to October, 1891, inclusive, the temperature averaged about normal in the middle and south Atlantic and east Gulf states, the Rio Grande, upper Mississippi, and Missouri valleys, the Ohio Valley and Tennessee, and along the Pacific coast. In the upper lake region, the extreme northwest, and over the northern plateau the temperature averaged from 1 to 2, and in New England and the lower lake region it was about 1 in excess of the normal. At Key West, Fla., on the middle-eastern slope of the Rocky Mountains, and over the middle plateau there was a deficiency of 1 to 2, and in the west Gulf states, on the northeast and southeast slopes of the Rocky Mountains, and over the southern plateau there was a deficiency of about 1 for the period named.

MAXIMUM TEMPERATURE.

At stations on the north Pacific coast, in the upper Mississippi and lower Missouri valleys, and the Lake region, and along the south New England and New Jersey coasts the maximum temperature was the highest ever reported for October by amounts varying from 1 to 4.

The maximum temperature was above 100 in the lower Gila and lower Colorado valleys, and was above 90 in the San Joaquin and Sacramento valleys, and at points from the middle and southeast slopes of the Rocky Mountains eastward to the Atlantic coast. The lowest maximum temperature was noted on the extreme north Pacific and extreme east and southeast New England coasts, where it was below 70.

MINIMUM TEMPERATURE.

At stations on the east and south New England coasts the minimum temperature was as low or lower than previously reported for October.

The minimum temperature was below 10 in the mountains of central Colorado, and was below 20 in northern New England, parts of eastern New York and northeastern Pennsylvania, on the northeast slope of the Rocky Mountains, over the greater part of the plateau region north of the 35th parallel, and in the higher Sierra Nevada Mountains in northeast California. The highest minimum temperature was noted over southern Florida, where it was above 60, and the minimum temperature was 50 or above in southern California, southwest Arizona, and along the west coast of the Gulf of Mexico.

LIMITS OF FREEZING WEATHER.

The southern limit of freezing weather is shown on Chart V by a line traced from the south New England coast southwestward to central Georgia, thence northward to eastern Tennessee, thence southward to southern Alabama, thence to southern Mississippi, thence northward east of the Mississippi River to central Illinois, thence to Oklahoma Territory, and thence over central Arizona, and the western limit is shown by this line continued northwestward over southern Nevada to east-central California, and thence northward, describing a curve to the eastward over the valley of the Columbia River, to British Columbia.

RANGES OF TEMPERATURE.

The greatest daily ranges of temperature are shown in the table of miscellaneous meteorological data. The greatest monthly ranges occurred in areas from the middle and northern plateau regions to New England, where they exceeded 60, whence they decreased to less than 40 on the southeast New England coast, to less than 20 in extreme southern Florida, to less than 30 on the east Gulf coast, and on the south and middle Pacific coasts, and to less than 30 on the north Pacific coast.

PERIODS OF HIGH TEMPERATURE.

On the 1st and 2d a warm wave, with the highest temperature ever recorded for October in the upper Mississippi valley and the west part of the Lake region, overspread the central valleys, whence it extended to the Atlantic coast, where the highest temperature of the month was noted from the 3d to the 5th. The highest temperature ever reported for October occurred at points in New York on the 4th, and on the New Jersey coast on the 5th. On the 7th the highest temperature on record for October occurred on the north Pacific coast. During the 7th and 8th the warm wave extended over the central valleys of California, and during the 8th and 9th over the west part of the plateau region from Idaho to Arizona. This warm wave was preceded on the 3d and 4th by the highest temperature of the month on the immediate middle and south Pacific coasts. From the Mississippi River to the Rocky Mountains the warmest weather was generally noted during the third decade of the month.

PERIODS OF LOW TEMPERATURE.

The lowest temperature of the month was noted on the north Pacific coast on the 1st, and the cool wave extended thence over the plateau region during the 2d and 3d. On the 6th the lowest temperature of the month occurred at points in the east part of the southern plateau and on the eastern slope of the Rocky Mountains, and by the 7th the cool wave had extended to Kansas, Indian Territory, and Texas, with temperature below freezing north of the 35th parallel, and by the 8th the cooler weather had reached the west Gulf coast, where the temperature continued low during the next three days, with the lowest readings of the month, and the lowest minimum temperature ever noted for the first decade of October. Cool weather prevailed over the central valleys and the middle Gulf states on the 20th. On the 22d and 23d the lowest temperature of the month occurred from the upper lake region to the middle Gulf coast, and the temperature fell below freezing in south and east Mississippi and west Alabama. By the 24th the cool wave had extended over the Florida Peninsula, where the lowest temperature of the month was noted, and the lowest minimum values of the month were reported in the east lower lake region on the 25th. During the 28th and 29th a cool wave overspread the country from New England to the east Gulf states; over the greater part of this region the lowest temperature of the month was noted on those dates, the line of freezing weather extended to central Georgia, and at stations on the east and south New England coasts the minimum temperature was as low or lower than previously reported for October.

FROST.

The first heavy frost of the season was reported as follows: 1st, Northfield, Vt.; at points in south New Hampshire, central Massachusetts, and central Pennsylvania; Carson City, Nev.; Walla Walla, Wash. 2d, Nordhoff, Ventura Co., Cal.; Montrose, Colo. 3d, Tucson, Ariz.; Salt Lake City, Utah; Rapid City, N. Dak. 4th, Santa Fé, N. Mex.; Denver and Pueblo Colo.; Wichita, Salina, and Wakefield, Kans.; North Platte, Nebr.; Alta and Storm Lake, Iowa. 5th, Springfield and Riley, Ill.; Manistee, Mich. 6th, Valentine, Nebr.; Larrabee, Iowa; Green Bay, Wis.; Alpena, Mich.; Indianapolis, Ind. 7th, Dodge City, Concordia, Kansas City, Leavenworth, Globe, and Independence, Kans.; Oklahoma, Okla. T.; Healdton, Ind. T.; Hampton, Iowa; Fort Smith, Ark.; Duluth, Saint Paul, and Minneapolis, Minn. 8th, Paragould, Ark.; Aberdeen, Miss. 9th, La Crosse, Wis.; Red Wing, Minn.; Davenport, Iowa; Grand Haven, Mich.; Oswego, N. Y.; Aqueduct, Pa. 10th, Manchester, N. H.; Dubuque, Iowa; Mesquite, Tex.; Gratiot, Westerville, and Lordstown, Ohio. 11th, Marquette, Mich. 12th, Eastport, Me.; Williamstown, Mass.; New Haven, Conn.; Albany, Lowville, Ithaca, Rochester, and Buffalo, N. Y.; Erie, Edinborough, and Le Roy, Pa.; Port Huron, Mich.; Cincinnati, Columbus, Cleveland, Garrettsville, and Tiffin, Ohio. 13th, Detroit, Mich.; Toledo and Sandusky, Ohio. 14th, Staunton, Va. 15th, Wytheville, Va.; Palestine, Ill.; Lebanon, Withers Mills, Saint Louis, and Columbia, Mo.; Vevay, Ind.; Yankton, S. Dak. 16th, Voluntown, Conn.; Dale Enterprise, Marion, Big Stone Gap, and Lexington, Va.; Parkersburgh, W. Va.; Talladega, Ala.; Louisville, Ky.; Knoxville, Chattanooga, Nashville, and Riddleton, Tenn.; Meridian, Miss.; Oswego, Charleston, and Sycamore, Ill.; Cedar Rapids, Clinton, and McCausland, Iowa; Harvey and Waukesha, Wis.

17th, Southington, Conn.; Beverly, N. J.; Pittsburg, Pa.; Woodstock, Md.; Buckhannon, W. Va.; Columbia, S. C.; Mount Pleasant, N. C.; Paducah, Ky.; North Lewisburgh, Ohio. 18th, Abilene, Kans. 19th, Vicksburg, Miss. 20th, Charlotte, N. C.; Atlanta, Cordele, and Forsyth, Ga.; Brownsville, Tenn.; Cairo and Olney, Ill.; Keokuk, Iowa; Warrenton, Mo.; Conway, Ark.; Shreveport, Cheneyville, and Liberty Hill, La. 21st, Augusta, Ga.; Montgomery, Ala. 22d, Amana, Iowa. 23d, Petersburgh and Richmond, Va.; Raleigh, Oak Ridge, and Wadeville, N. C.; Statesburgh and Tillers Ferry, S. C.; Poulan and Albany, Ga.; Bermuda, Ala.; Agricultural College, Water Valley, and Yazoo City, Miss.; Memphis, Tenn.; Jacksonborough, Ohio; Little Rock, Stuttgart, Lonoke, and Osceola, Ark.; Alexandria and Marksville, La. 24th, Fall River, Royalston, Vineyard Haven, and Somerset, Mass.; Narragansett Pier, R. I.; Spottsville, Va.; Lumberton, Wadesborough, and Weldon, N. C.; Cheraw and Effingham, S. C. 25th, Boston, Mass.; Atlantic City, New Brunswick, Egg Harbor City, and Moorestown, N. J.; Harrisburg and Philadelphia, Pa. 26th, Kingston, Tenn. 28th, New York, N. Y.; Lynchburgh and Nottaway C. H., Va.; Glenville, W. Va.; Goldsborough, N. C.; University, Miss.; Manton, Mich. 29th, Cambridge, Woods Holl, and New Bedford, Mass.; Block Island, R. I.; New London, Conn.; Dover, Del.; Baltimore, Md.; Washington, D. C.; Cape Charles, Stanardsville, Norfolk, Birdsnest, Mossing Ford, and Salem, Va.; Wilmington, Lenoir, New Berne, and Lewisburgh, N. C.; Jacksonborough and Hardeeville, S. C.; Americus and Thomasville, Ga. 31st, Olympia, Wash.

Heavy frost occurred in the interior of the west Gulf states from the 19th to 23d, and in the interior of the east Gulf and south Atlantic states at intervals during the third decade of the month. Light frost was reported in north part of the Florida Peninsula from the 20th to 24th, and on the 24th it was noted as far south as Pasadena, Pasco Co., Fla.

The occurrence of heavy frost in the south part of the Gulf States is unusual in October, the average date of first killing frost in that region being from November 1st to 15th. In the Carolinas the heavy frost of the current month was about seasonable.